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Publication date:
2011

Document Version
Publisher's PDF, also known as Version of record

Amino acid salt solutions as solvents in CO_2 capture from flue gas; CO_2 loading capacity and precipitation.

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Keywords : CO_2 capture; amino acid salt solutions; CO_2 loading capacity; Precipitation

New solvents based on the salts of amino acids have emerged as an alternative to the alkanolamine solutions, for the chemical absorption of CO_2 from flue gas. But only few studies on amino acids as CO_2 capturing agents have been performed so far. One of the interesting features of amino acid salt solutions is their ability to form solid precipitates upon the absorption of CO_2. The occurrence of crystallization offers the possibility of increasing the CO_2 loading capacity of the solvent. However, precipitation can also have negative effect on the CO_2 capture process. The chemical nature of the solid formed is a decisive factor in determining the effect of precipitation on the process.

For the purpose of studying the CO_2 loading capacity of amino acid salt solutions, we developed an experimental set-up based on a dynamic analytical mode, with analysis of the effluent gas. Using this set-up, the CO_2 loading capacity of aqueous solutions of the potassium salts of selected amino-acids (glycine, taurine, lysine proline, and glutamic acid) were examined, and the relation between the initial amino acid salt concentration and precipitation ability of each solution were determined. Experiments were performed at a partial pressure of CO_2 close to 10 kPa, and a total pressure around 100 kPa, and a temperature close to 298 K. The obtained precipitates were analyzed using X-ray diffraction and infra-red spectroscopy. It was verified that the precipitate consisted of the amino acid itself in the case of glycine, taurine, and lysine, while in the case of proline, and glutamic acid, the precipitate was found to be bicarbonate. These results give an important contribution to further understanding the potential of amino acid salt solutions in CO_2 capture from flue gas.